

Nevada Space Grant Consortium
Lead Institution: Nevada System of Higher Education
Director: Christian H. Fritsen
Telephone Number: (775) 673-7487
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PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Nevada Space Grant Consortium is a Capability Enhancement Consortium funded at a level of \$430, 000 for fiscal year 2012.

PROGRAM GOALS

A. *Consortium Goals and SMART Objectives from your 2010 base proposal and budget (or as amended in subsequent submissions):*

The goal of the Nevada NASA Space Grant Consortium is to create and expand opportunities for Nevada students and faculty to be active and valued participants in our Nation's NASA aeronautics and space programs. NVSGC meets this general goal by implementing programs within Nevada that target the following objectives:

Objective #1: Recruit: We will a) recruit, train and reward scholars and fellows within all of our academic institutions, b) strive to ensure that they are representative of our state's population, and c) engage faculty and students at all NSHE institutions such that they acknowledge and promote successes of scholars and fellows in ways that enhance employment in STEM careers.

Objective #2: Support and Guide: NVSGC will develop new avenues for NASA research projects in Nevada that will ultimately result in new publications or research proposals to NASA.

Objective #3: Develop Curricula: Establish new courses and infuse NASA-related content within the NSHE institution's curricula.

Objective #4: Engage: Engage students in internships and academy positions at Industrial Affiliates and NASA centers.

Objective #5: Compete: Conduct curricular and extracurricular programs where multiple students are involved in hands-on science or engineering activities with an emphasis on the development of teams that compete in science and engineering competitions rooted in NASA-relevant and real world problems.

Objective #6: Promote STEM materials: Promote and increase the awareness and availability of NASA content-based STEM materials among teachers so that they can effectively integrate these in their future teaching endeavors.

Objective #7: Promote STEM literacy: Promote STEM literacy and increase awareness and perceived importance of NASA's missions through NVSGC activities.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1, 2, & 3)

Provide concise, meaningful highlights or anecdotes (no more than three) that are directly related to work completed in 2012, highlighting student and/or project accomplishments. Specify alignment to an Outcome.

Anecdote for Contributing to Outcome 1- i.e. the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals:

Funding from NVSGC has enhanced the development of a Jr. faculty's (Dr. J. Huntington) new research programs. Specifically, the work has led to enhancements of the Desert Research Institute's automated algorithms for use on NASA supercomputers to successfully demonstrate capable Nevada infrastructure and institutional expertise relevant to the Landsat mission. Dr. Huntington was then selected to serve on the 2012-2017 NASA/USGS Landsat Science Team. Huntington's main contribution to the Landsat Science team focuses on enhancing Landsat derived and automation of Evapotranspiration over the western U.S. for water resource studies (utilizing DRI algorithms and DRI computer clusters; http://landsat.gsfc.nasa.gov/news/news-archive/news_0521.html). Additionally, Dr. Huntington was recently awarded a Google Faculty Research Grant to implement DRI automated METRIC algorithms on Google Earth Engine super computers.

Anecdote for Contributing to Outcome 2: Through a partnership among the colleges of Engineering and Education at UNR a new course was developed for pre-college teachers that are working in teams of 4-5 members that design, build, and test an autonomous hovercraft. This tried-and-true project has been vetted by over 1,000 freshmen engineering students at UNR and is now being modified such that the course content/learning objectives are better suited for pre-college teacher and their profession. In this first offering 34 student have taken the course (with 94% being women, ethnicity of participants has yet to be reported). The implementation of this course along with the need for more teachers trained with STEM practical and instructional knowledge in the Washoe County School District's STEM Academies has led to the development of new curricula where teachers can now earn a conferred STEM endorsement. The aim is to better attract and retain students in STEM fields in Nevada by having better STEM instruction in these academies.

PROGRAM ACCOMPLISHMENTS:

Refer directly to the consortium goals and SMART objectives in your 2010 base proposal when describing your accomplishments.

Outcome 1: *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals:* (Discussion of achievements and progress related to your Fellowship/Scholarship, Higher Education and Research Infrastructure programs). *(Employ and Educate)*

Fellowship/Scholarship:

NVSGC awarded 4 fellowships and 11 scholarships through open competitions in FY12. The fellows are presently working on their graduate programs in engineering and sciences at UNLV and UNR; whereas, the 11 scholars are working in their engineering and science colleges at UNR, UNLV, Truckee Meadows Community College (TMCC) and Western Nevada College (WNC). Participation was at 25% women, and 25% minority participation in fellowships and 27% women with no minorities in undergraduate scholarship awards. Both participation metrics are below the NVSGC targets of 50% women and 26 % minority participation. The NVSGC did see progress toward the general goal of getting applications from other campuses (beyond UNR and UNLV) and competitively awarded scholarships to both TMCC and WNC students. Greater than 90% of the students have reported positive benefit from the financial award based on their performance and potential.

Research Infrastructure: NVSGC resources for research infrastructure building were competed in FY12 that resulted in new awards and programs. These new programs in combination with some of the ongoing and finishing programs have led to new accomplishments and outcomes targeted at the NVSGC *Objective #2- (Support and Guide: ---develop new avenues for NASA research projects in Nevada that will ultimately result in new publications or research proposals to NASA).*

Specifically, ongoing programs included the following work:

- Dr. L. Hausrath (UNLV), her students and collaborators at JPL (J. Hurowitz) studied biosignatures in calcium and clay minerals that may provide constraints on conditions of formation of clay mineral deposits on Mars;
- Dr. S. Latifi (UNLV) students and collaborators worked to develop a control system on a chip for a two dimensional liquid crystal beam steering system for WPT applications in space.
- Dr. E. Geiger (UNR) students and collaborators worked on wireless network sensors for Microalgae Technology projects at NASA Ames.
- Dr. A. Derevianko (UNR), students and collaborator (at Columbia University) worked on cosmic plasmas and the generation of dielectronic recombination data.

This work continued to engage five faculty and over 10 advanced students within NSHE and resulted in continued collaborations with at least four NASA collaborators at 3 NASA centers. These efforts have led to new proposals totaling over \$500,000 at the time of this report. These faculty are also anticipating 3-4 more papers and 3-4 more proposals in FY13- which is often typical of the lag between funding of research activities and these two measured desired outcomes (proposals and peer- reviewed papers).

New research projects that were started in FY12 (as a result of open state-wide competitions) were those of Drs. E. Wang (UNR), J. Huntington (DRI) and E. Geiger (UNR) and their CoIs and students. This new work is spanning the development of technologies for unmanned parachute systems (Wang), the automation of remote sensing energy balance fluxes in the Central Valley of California (J. Huntington) and the utilization of microfluidic diagnostics of microalgae that can be used for NASA's green aviation fuels (Geiger).

The new FY12 projects are initially engaging additional faculty (4 as PIs and CoIs) and students (at least seven) in new research projects (with NASA collaborators) and has already resulted in more than 7 presentations, 5 papers (in review or published) and over \$350,000 in funding from NASA, USGS, and Google.

Recent presentations included several at the AIAA national meeting, one at a NASA funded remote sensing of ET workshop (<http://www.westernstatesetorkshop.com>) and 6 additional presentations at local and national meetings. Additionally, Dr. J. Huntington was selected to serve on an expert panel for a remote sensing workshop sponsored by NASA, California Water Foundation, Water Education Foundation and the Environmental Defense Fund (http://www.watereducation.org/userfiles/Remote_Sensing_Agenda.pdf).

Overall, the participation in the research infrastructure projects totals nine faculty, over 14 students, and entails at least five collaborations with NASA centers and personnel. The outcomes/results are meeting the targets for collaborations and new contacts with NASA, presentations and papers (5-7 per year) and grants (2 per year). Participation in these research efforts by underrepresented groups, however, is lower than the NVSGC target (50% female, and 28% minorities) and remains a targeted area for improvement. The identified area of specific concern and improvement is in the engineering research projects that are dominated by engineering and college applicants that are not diverse.

Higher Education Curricula Development: NVSGC had ongoing curricula development efforts as well as newly funded curricula development awards in FY12 to meet the NVSGC Objective#3 (To establish new courses and infuse NASA-related content within the NSHE institution's curricula). Specifically, four curricula/courses were developed in areas of Earth sciences at both Sierra Nevada College (SNC) and Nevada State College (NSC). An intensive bio-robotics course was developed and taught at UNLV and engineering and hands on robotics and ballooning activities were developed and offered for K-12 teacher development within UNR's College of Education as well as at TMCC. The nature of these courses are provided in paragraphs below and effectively demonstrate that the NVSGC has met and exceeded its objectives of developing 3-5 new sustainable courses with the engagement of 3 or more advanced students and participation of 40 or more students in the courses and curricula. Among the directly funded participant faculty (7) - one was female and none were from underrepresented groups.

Three new courses created at Sierra Nevada College (by Dr. A. Rost) were implanted to start a new Earth Science Curricula (Introduction to Geology, ESCI 101

(with lab ESCI 105), Hydrology and Water Resources, ESCI 301 (with lab, ESCI 305) and Special Topics, Geology of the Sierra Nevada, ESCI 480). The special topics course (Geology of the Sierra Nevada, ESCI 480) was offered in the spring term 2012, and ran at maximum capacity (12 students). ESCI 101/105 ran in the fall of 2012 with eight students and ESCI 301/305 is currently offered (spring 2013) with 13 students. Average students/instructor ratio campus wide is about 15/1. Total participation was 33 students- with 50% female and 6% minorities. The curricula and courses are now routinely offered on that campus and are sustained beyond the funding from NVSGC.

With funding provided by the Nevada NASA Space Grant Consortium, Dr. Ed Price of Nevada State College (NSC) provided an underrepresented population of environmental science majors an introductory field experience in which they identified and mapped geologic units and natural hazards, using satellite imagery and actual field checks. He then also developed course on climate change. These were not typical courses in the NSC curriculum. In the geology course students learned about the practical links between remote imagery interpretation and ground-truth mapping, and how humans can easily influence the Earth's surface processes (such as facilitating exceptionally rapid erosion or sediment deposition). The final product of the course was a student-produced geologic map of a section of the Las Vegas Wash. Students delineated geologic units and geologically hazardous areas due to historic and recent canyon wall collapses.

In the summer of 2012, Drs. David Lee, Mohamed Trabia, and Woosoon Yim taught an intensive summer short course in biorobotics at UNLV. This course was an extraordinary challenge wherein students designed, built, and controlled their own robots in a single week – an effort that usually takes months or even an entire year. The unifying theme of these diverse designs was a biologically inspired interaction of the robot with its environment through force sensing, which is a timely challenge given the increasing need for dexterous robotic manipulation and locomotion in space. Students initially explored biomechanical principles in the *Laboratory of Comparative Biomechanics* then built and tested robots of their own design in the *Mendenhall Innovation Laboratory* at UNLV. They also toured *Pololu Robotics* – a major robotics company based in Las Vegas, NV, where they observed laser cutting of their own custom robot parts and learned about Pololu products and employment. Planning, preparation and teaching UNLV's first *Biorobotics Short Course* was a fruitful cross-disciplinary collaboration between faculty of the *School of Life Sciences* and the *Department of Mechanical Engineering* at UNLV. As a result, this course strongly emphasized the application of STEM principles through exploration of biological and physical fundamentals combined with hands-on robot design, building, and testing. Five UNLV undergraduate students (including one female and three from underrepresented minority groups) in the Colleges of Science and Engineering completed this course.

Through a partnership between the colleges of Engineering and Education at UNR a new course was initially developed for pre-college teachers that are working in teams of 4-5 to design, build, and test an autonomous hovercraft. This tried-and-true project has been vetted by over 1,000 freshmen engineering students at UNR and is now being slightly modified such that the course content/learning objectives are better suited for pre-college teacher and their profession. The implementation of this course along the call for more teachers trained with broad STEM knowledge in Washoe County School

Districts STEM Academies has led to proposed STEM curricula that teachers can earn a STEM endorsement. In this first offering 34 student are taking the course with (94% being women, ethnicity participation has yet to be reported).

Dr. Ann Marie Vollstedt at TMCC in partnership with UNR College of Education Professor (Dr. M. Robinson) developed and provided a STEM training course for 10 middle school science and math teachers in Reno as well as the necessary project materials that allowed them to take these lessons into their classrooms. The teachers created and implemented lesson plans that used robotics kits to teach STEM topics. The teachers have all been successful in implementing a robotics program at their schools and most have committed to continue to use the program and create new lessons. The lessons focus on space navigation and thus these topics are discussed in the class as well. Teachers indicated that they encourage students to pursue STEM careers while working on these lessons in their classrooms. Participation by women students was high at 90% in this activity, minority participation numbers have yet to be fully reported.

Higher Education: Internships: The NVSGC facilitates and promotes the engagement of students in internships and academy positions at Industrial Affiliates and NASA centers (Objective #4- Internships). During FY12- NVSGC did not provide direct funding for interns in a traditional means, yet facilitated the placement of interns at JPL as a result of the work on the projects of wireless transmission and on clay mineralogy. The first student was supported by NASA funding whereas the second utilized NVSGC fellowship funding to facilitate the time and travel to Southern California.

Higher Education: Hands On Training: NVSGC seeks to conduct curricular and extracurricular programs where multiple students are involved in hands-on science or engineering activities with an emphasis on the development of teams that compete in science and engineering competitions rooted in NASA-relevant and real world problems (Objective #5). Two of this year's Hands-on-Training (HOT) activities led to teams competing in competitions while three others conducted valued hands-on training activities that were targeted at engaging multiple students in team settings- yet the teams or activities were not amenable to a competition (e.g. sampling and analysis of extremophiles can require hands-on field and laboratory teamwork- yet is not necessarily amenable to competition- to the degree that engineering or aeronautical performances can be)

The Annual Lighter-than-Air Vehicle Competition is now in its 4th year at TMCC and is mainly supported by contributions from TMCC as well as the TMCC foundation. The Event is still recognized as a NVSGC activity due to its inception as well as the continued recruitment, training, promotion and oversight provided by Dr. D. Loran, the NVSGC campus director at TMCC. Seventeen students (23% women) formed four teams that built vehicles that outperformed vehicles times in the same course from prior years. Winning team members once again gained tuition scholarships (provided by TMCC foundation). All local media outlets provided coverage and initial analysis indicated over 1 million views of materials with over \$68k of comparable media advertisement being

provided by the attention on the event (minority participation at the community college event is still to be reported).

The NVSGC sponsored Moonbuggy Program continued in FY12 with concurrent engagement of both higher Education participants (at UNR) as well as pre-college participants at the Reno AACT high school and TMCC high school. The project centers around design and fabrication of a vehicle for NASA's annual Great Moonbuggy Race engineering design challenge by a secondary education student team led by higher education participants: graduate students, undergrads, and faculty. The moonbuggy project is specifically aimed to give higher education students (graduate students and undergrads, pre-service educators) hands on experience in implementing this sort of STEM competition activity. Three college students have been engaged in the design and mentoring of high school activity in FY12 (33% female, minority participation to be reported following completion of competition and gaining credit for course).

Brendan O'Toole and Pushkin Kachroo conducted a new engineering class where students used dynamics analysis skills and 3D CAD modeling software to design and simulate the performance of a robotic vehicle; then learned how to maximize the capabilities of servos and DC motors; using master control theory to write an efficient PID controller using feedback data from multiple sensors. The NASA Space Grant HOT funding was used to create this class in the Mechanical Engineering Department at UNLV. In addition, the HOT funding helped modify and expand an Arduino based Mechatronics learning module that is used as a self-pace lab in three Electrical Engineering Courses. Short, 3-hour modules were additionally developed that translated into use in workshops for K-12 students and teachers. This led to several middle school and high school hands-on workshops for over 150 K-12 students and teachers. This work was a result of partnerships that involved not only NVSGC but also the Mendenhall Innovation Program and the Center for Math Science and Engineering Education (at UNLV). YouTube. <http://tanke495.weebly.com/index.html>

NevadaSat activities continued in FY12 (run by Dr. Eric Wang and J. Lacombe). The ongoing multi-faceted program provided students with exposure to aerospace activities. For 9+ years, the program has included activities in scientific ballooning, rocketry, rovers, and Earth-orbiting satellites. This year, the focus was on the most productive programs for aerospace workforce development and with the target of developing better BalloonSat capabilities across the state. In the last year, this program provided over 100 indirect participants with opportunities to develop hands-on skills and experiences relevant to the aerospace technical workforce. Direct participation among faculty and students was on the order of 5 faculty and 4 college students.

Camille Naaktgeboren of the College of Southern Nevada (CSN) led a research activity on the topic the Origins of Life: Analogs with Extremophiles. The activity took place in two cohorts over the spring, summer, and fall of 2012. The first cohort sampled a canyon near the Hoover Dam for thermophiles-those organisms that grow in high temperatures. They found and isolated many different species of prokaryotic organisms that grow in the hot springs of this canyon. The second cohort studied halophiles (those organisms that

live in very salty conditions) in the same canyon. They also found several different organisms from the soil and salt deposits on the walls of the canyon. The work plan has been to maintain these cultures and study them further for potential industrial applications. Over 20 students were able to participate in the research and gain valuable experience in the laboratory with special techniques as well as the process of research in general. Some students plan to continue with research opportunities in other laboratories around the valley because of their experience in the activity.

Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty:* (Discussion of achievements primarily focused on your Higher Education programs not discussed in Outcome 1 and your Precollege programs). (*Educate and Engage*)

Precollege:

As reported above for the HOT activity associated with the Moonbuggy competition, this activity engaged a larger number of high school students (11) and in-service teachers (5) such that its results primarily contribute to Outcome 2. However, the activity is truly a flywheel for the range of activities with results that pertain to many of the desired outcomes and NASA Education Priorities (listed in appropriate places below)- including expanding the national network through the engagement of local private industry partnerships.

A STEM Educators Workshop for Washoe County teachers was held in December at the Desert Research Institute in Reno, NV. DRI researchers Dr. Tamara Wall, Dr. Eric Wilcox, and Western Regional Climate Center Climatologist Nina Oakley worked with 14 in-service teachers to design an active learning project tailored to each teacher's individual needs for curriculum support. The workshop focused on providing a basic understanding of satellite data, climate conditions, and used the NASA Earth Observations (NEO) website. The implementation of activities and outcomes within the classrooms are being assessed as this is an ongoing activity.

Outcome 3: *Build strategic partnerships and linkages between STEM formal and informal education providers that promote STEM literacy and awareness of NASA's mission:* (Achievements and progress of Informal Education programs) (*Engage and Inspire*).

George Rhee and Amanda Maxham implemented a high altitude balloon project at UNLV in 2012. The program involved 20 high school students, 4 undergraduates, 5 graduate students, 2 post-docs, 5 professors, 10 amateur radio operators and members of the wider community. The project gained donations and formed partnerships with engineering companies who were enthusiastic to team with students and educators to push forward the STEM agenda. We received about \$5,400 in contributions from our partners (Energizer, Alicat Scientific, Byonics, Argent Data Systems, Lemos International, Omni Instruments, Kenwood). The program was supported by three not-for-profit community groups (Las Vegas Radio Amateur Club, Las Vegas Repeater

Association, Air Force Base Amateur Radio Club)

- Students toured the local NOAA facility and observed a weather balloon launch
- Local television news interviewed the SAGE class
- A popular video gaming website published a student solicited article which gained over 18,000 hits
- Dr. Maxham gave four talks to community groups with an approximate audience of 140 participants and delivered the key-note address in the local elementary school science fair .
- The Washington County, Utah Public Libraries and Nipton, CA provided launch facilities
- Four additional community members participated in a guest lecture series- each contributing 2-hour hands-on lectures related to the project content.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- **Student Data and Longitudinal Tracking:** Number of program student participants employed by NASA, aerospace contractors, universities, and other educational institutions; Number of undergraduate students who move on to advanced education in NASA-related disciplines; Number of underrepresented and underserved students participating.

Total awards= 48; Fellowship/Scholarship= 14, Higher Education/Research Infrastructure= 34; 75% of the significant awards were to women. Only 5 (or 14%) have been reported to be from underrepresented groups. None have graduated and from their respective programs, however, 30 of the Masters students in the STEM education program have accepted positions with Nevada school districts.

- **Minority-Serving Institution Collaborations:** Summarize interactions. Reference the names of projects with MSI collaborations.
No MSI partnerships formed or transpired using NVSGC funding in FY12; (note that Nevada has none designated MSI's at this time).
- **NASA Education Priorities:** *Accomplishments related to the "Current Areas of Emphasis" stated in the 2010 Space Grant solicitation. Report on areas that apply to work proposed in your proposal and budget.*
 - Authentic, hands-on student experiences in science and engineering disciplines – the incorporation of active participation by students in hands-on learning or practice with experiences rooted in NASA-related, STEM-focused questions and issues; the incorporation of real-life problem-solving and needs as the context for activities.

The NVSGC specifically targets the HOT projects. The program conducted HOT training at TMCC, UNR, UNLV, DRI and as described above- under objective 4 and 5 accomplishments. The areas of training were primarily in engineering, geology and the life sciences pertaining to the search for life beyond earth.

- Diversity of institutions, faculty, and student participants (gender, underrepresented, underserved).

The NVSGC engaged 7 out of eight institutions of higher Education within NSHE (and an additional institution that is not within NSHE) through its funded programs across many disciplines (Astrophysics, Geology, Engineering, Astrobiology).

- Engage middle school teachers in hands-on curriculum enhancement capabilities through exposure to NASA scientific and technical expertise. Capabilities for teachers to provide authentic, hands-on middle school student experiences in science and engineering disciplines (see above).

The NVSGC had 4 programs (described in more detail above) that engaged and trained middle school teachers, and that are leading to the implementation of STEM lessons in Nevada Classrooms.

- Summer opportunities for secondary students on college campuses with the objective of increased enrollment in STEM disciplines or interest in STEM careers.

The Moonbuggy competition activity is one example of engaging secondary students in yearlong activities (including summer) that has led to the majority of the past years 20+ participants enrolling in UNR's mechanical engineering or TMCC's engineering colleges. Private partnerships with this activity also has aided in increasing the interest in the STEM careers by showing students tangible career opportunities with local industry.

- Community Colleges – develop new relationships as well as sustain and strengthen existing institutional relationships with community colleges.

NVSGC remains committed to the partnership with TMCC and its state's four year colleges. The activities at TMCC includes recruiting and funding scholars, conducting HOT competitions, and providing resources for faculty to develop STEM courses (e.g. robotics courses and teacher training)

- Aeronautics research – research in traditional aeronautics disciplines; research in areas that are appropriate to NASA's unique capabilities; directly address the fundamental research needs of the Next Generation Air Transportation System (NextGen).

NVSGC fosters the collaborations for unmanned aerial vehicle technologies and testing. This general aim is aligned with the State's emphasis on aeronautical and

UAVs as well. Specific activities funded include the Research projects on Dropesondes and unmanned parachute navigation.

- Environmental Science and Global Climate Change – research and activities to better understand Earth's environments.

The NVSGC fosters climate change education and research and is an explicit emphasis in its current strategic plan and operations. The expertise within NSHE regarding climate at the Polar Regions as well as within the Great Basins of the world as well as the expertise in hydrologic processes in arid environments makes the NVSGC an active participant in climate change studies. Specific contributions funded by NVSGC resources in FY12 include the development of the LandSat capabilities and personnel commitment to the Land Sat mission at DRI. Additionally, NVSGC developed an additional climate change course at SNC which serves a large population of underrepresented groups and underserved communities in southern Nevada/Las Vegas.

- Enhance the capacity of institutions to support innovative research infrastructure activities to enable early career faculty to focus their research toward NASA priorities.

The NVSGC recognizes the value of early career development and as such has funded works by faculty at TMCC (Ann Marie Vollstedt), UNLV (Elizabeth Hausrath), UNR (Emil Geiger) and DRI (Justin Huntington) of which have valued engagement in NASA programs and contributions to desired NASA Education outcomes (as described above).

IMPROVEMENTS MADE IN THE PAST YEAR

Succinctly describe improvements and/or adjustments made last year that demonstrate significant change(s) within the consortium. The improvements and/or adjustments that brought about change may have been in management, resource allocation, project design, project evaluation, etc.

The NVSGC is making progress to improve in areas specific to reporting, participation and engagement of underrepresented groups. Changes in the consortium are underway and include the following:

- transitioning of three campus Associate Directors (Great Basin College, CSN, and DRI), who are either retiring or have moved into different administrative roles on their campuses.

- clearly delineating the day-to-day operational roles of the State-wide Associate Director and the Director. Such delineations have already begun and entail partial separation of roles for leading tasks associated with state-wide pre and post award activities, such that the AD has oversight on tasks for project solicitation, review selection and awarding, and while the Director is ultimately responsible of operations, he will initially be providing oversight on mentoring of programs and reporting. Additional

roles for program development, promotion and growth and maintenance of the Nevada network and engagement of the Nevada Space Grant TAC are still under development.

- Recruiting and training a program coordinator and defining the roles of that position in relation to the NSHE research administrators (that are presently and temporarily fulfilling this role for the consortia).

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

List the institutions that comprise the consortium; include the name, type of institution, key characteristics, and role.

NVSGC has eight member higher education learning institutions across the state, including: the University of Nevada, Las Vegas (UNLV); the University of Nevada, Reno (UNR); the Desert Research Institute (DRI); the College of Southern Nevada (CSN); Great Basin College (GBC); Truckee Meadows Community College (TMCC); Western Nevada College (WNC), and Nevada State College (NSC). Campus Associate Directors, in conjunction with two NSHE research administrators comprise an internal advisory committee that aids in setting yearly operational goals and aims. The Director of the Nevada NASA Space Grant/EPSCoR Program reports to the Vice Chancellor and the Nevada System of Higher Education's (NSHE) Research Affairs Council. Thus, the consortium operations are run as a system-wide program with those with higher education interests represented.

The Consortium also includes industry and education partners. Digital Solid State Propulsion (Reno, NV), Equipment Links, Inc. (Las Vegas, NV) . Sierra Particle Technologies (Reno, NV) and Summit Products (Minden, NV). The Challenger Learning Center of Northern Nevada, the Fleischmann Planetarium & Science Center, the Jack C. Davis Observatory at WNC and K-12 Washoe County School District's Science Program Coordinator form the present consortium education partners. The industrial and educational partners' roles in the consortium lie mainly in implementing internship opportunities, as well as informal education and precollege programs. They also are invited and participate in planning and operations and aid in communicating and facilitating NASA program opportunities.

The National Space Grant Office requires two annual reports, this Annual Performance Data Report (APD) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.